

is two-layered (overlaid by the epidermis), the inner layer differentiating as the tapetum; the stalk cell is represented only by a nucleus; the two male cells are equal, and occasionally three or four male cells derived from a single body cell were observed; four to ten archegonia are included in the single complex; the fusion nucleus becomes invested by the starch-filled cytoplasm of the male cell; at the first segmentation the male and female chromatin groups are still distinct.—J. M. C.

**Respiration.**—CZAPEK<sup>30</sup> gives an excellent summary of all work done on respiration of plants up to the present time. It is marked by conciseness and by emphasis on important points. One is surprised that the subject can be treated so thoroughly within the limits of twenty-five pages. The following topics are considered: definition and history, the amount and distribution of aerobic respiration in plants, physical and chemical factors capable of influencing respiration, postmortem carbon dioxide production and oxygen absorption, chemical materials of aerobic respiration, and the mechanism of vital oxidation (statement of our knowledge of respiratory enzymes). The literature considered involves 126 citations.

In discussing the materials used (oxidized) in aerobic respiration, CZAPEK mentions sugars and fats as the principal ones; but emphasizes the fact that in many bacteria (hydrogen, sulfur, nitrifying, etc.) the simplest inorganic substances are oxidized as a source of energy for carrying on life processes, while in many other cases the most complex proteins are split and finally oxidized for the same purpose. It is evident that this gives aerobic respiration a broad meaning. CZAPEK seems very much inclined to distinguish vital oxidations (*vitalen Verbrennungsprozess*) from other oxidations. Vital seems to mean more to him than merely a term to express the unknown.—WILLIAM CROCKER.

**The fertile spike of Ophioglossaceae.**—The nature of the so-called fertile spike of the Ophioglossaceae has been a prolific cause of discussion, culminating in the divergent views of BOWER and CAMPBELL. CHRYSLER<sup>31</sup> has now attacked the problem from the standpoint of vascular anatomy, examining all the genera, and has reached some important and apparently convincing conclusions.

The fertile spike is regarded as representing two fused leaflets or pinnae (basal pair) of a fern leaf. The proof is most obvious in *Botrychium virginianum*, in which each one of the pair of vascular bundles that supply the fertile spike leaves a gap in the trough-shaped leaf trace. This is sometimes less distinct in *B. ternatum* and *B. obliquum*, and certain other species show no trace of the gap; all of which are taken as indications of reduction. Abnormal specimens also confirm the view. The condition in *Ophioglossum* is considered to be derived

<sup>30</sup> CZAPEK, FR., Die Atmung der Pflanzen. Ergebnisse der Physiologie 9:587-613. 1910.

<sup>31</sup> CHRYSLER, M. A., The nature of the fertile spike in the Ophioglossaceae. Annals of Botany 24:1-18. pls. 1, 2. figs. 16. 1910.